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## TECHNICAL MANUAL

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**OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT AND  
GENERAL SUPPORT MAINTENANCE MANUAL**

**AIR CONDITIONER, FLOOR MOUNTED,  
AIR COOLED, ELECTRIC MOTOR DRIVEN,  
3/4 HP, 60 HERTZ, AC  
SINGLE PHASE, 9,000 BTU/HR  
(HARVEY W. HOTTEL, INC. MODEL HAC-750  
NSN 4120-00-592-4645**

This copy is a reprint which includes current  
pages from Change 1

Before removing any components from the air conditioner care must be taken to disconnect the input power to the unit. This will insure the safety of personnel and prevent damage to the air conditioner.

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F (38°C).

The burning of polyurethane foams is dangerous. Due to the chemical composition of a polyurethane foam, toxic fumes are released when it is burned or heated. If it is burned or heated indoors, such as during a welding operation near by, you should take care to ventilate the area thoroughly. An exhaust system like that of a paint spray booth should be used. Air supplied respirators, approved by the National Institute for Occupational Safety and Health or the U. S. Bureau of Mines, should be used for all welding in confined spaces and in places where ventilation is inadequate. Persons who have chronic or recurrent respiratory conditions, including allergies and asthma should not work in these areas.

## **CAUTION**

Personnel with history or other evidence of cardiac rhythm disturbances should be evaluated by local medical authorities before working in environments where potential freon exposure may occur.

Operator, Organizational, Direct Support  
and General Support Maintenance Manual

AIR CONDITIONER, FLOOR MOUNTED,  
AIR COOLED, ELECTRIC MOTOR DRIVEN, 3/4 HP, 60 HERTZ,  
AC SINGLE PHASE, 9,000 BTU/HR (HARVEY W. HOTTEL, INC.  
MODEL HAC-750H) NSN 4120-00-592-4645

TM 5-4120-351-14, 19 January 1979, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages

i and ii  
1-1 and 1-2  
1-5 and 1-6  
3-1 and 3-2  
4-3 and 4-4  
6-1/6-2

Insert pages

i and ii  
1-1 and 1-2  
1-5 and 1-6  
3-1 and 3-2  
4-3 through 4-4.1/4-4.2  
6-1/6-2

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

Official:

JOHN A. WICKHAM, JR.  
*General, United States Army*  
*Chief of Staff*

R. L. DILWORTH

*Brigadier General, United States Army*  
*The Adjutant General*

DISTRIBUTION:

To be distributed in accordance with DA Form 12-25A, Operator, Organizational, Direct Support and General Support maintenance requirements for Air Conditioner, Floor Mounted, 9000 BTU, 3/4 HP, 60HZ, AC, 1PH (HAC-751H)



**AIR CONDITIONER, FLOOR MOUNTED, AIR COOLED  
ELECTRIC MOTOR DRIVEN, 3/4 HP, 60 HERTZ AC  
SINGLE PHASE, 9,000 BTU/HR  
(HARVEY W. HOTTEL, INC. MODEL HAC-750H)  
NSN 4120-00-592-4645**

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Troop Support Command, ATTN: AMSTR-MCTS, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. A reply will be furnished directly to you.

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## **. Scope**

This manual is for your use in operating and maintaining the Model HAC-750H Air Conditioner.

## **. Maintenance Forms and Records**

Maintenance forms and records that you are required to use are explained in DA Form 738-750, The Army Maintenance Management System (TAMMS).

## **. Equipment Serviceability Criteria**

This equipment is not covered by an ESC.

## **1-4. Destruction of Army Materiel to Prevent Enemy Use**

Instructions for destruction of materiel to prevent enemy use can be found in TM 750-244-3, Procedures for Destruction of Equipment to Prevent Enemy Use.

## **1-5. Administrative Storage**

Preparation, care and removal of equipment in administrative storage will be in accordance with the requirements of TM 740-90-1, Administrative Storage.

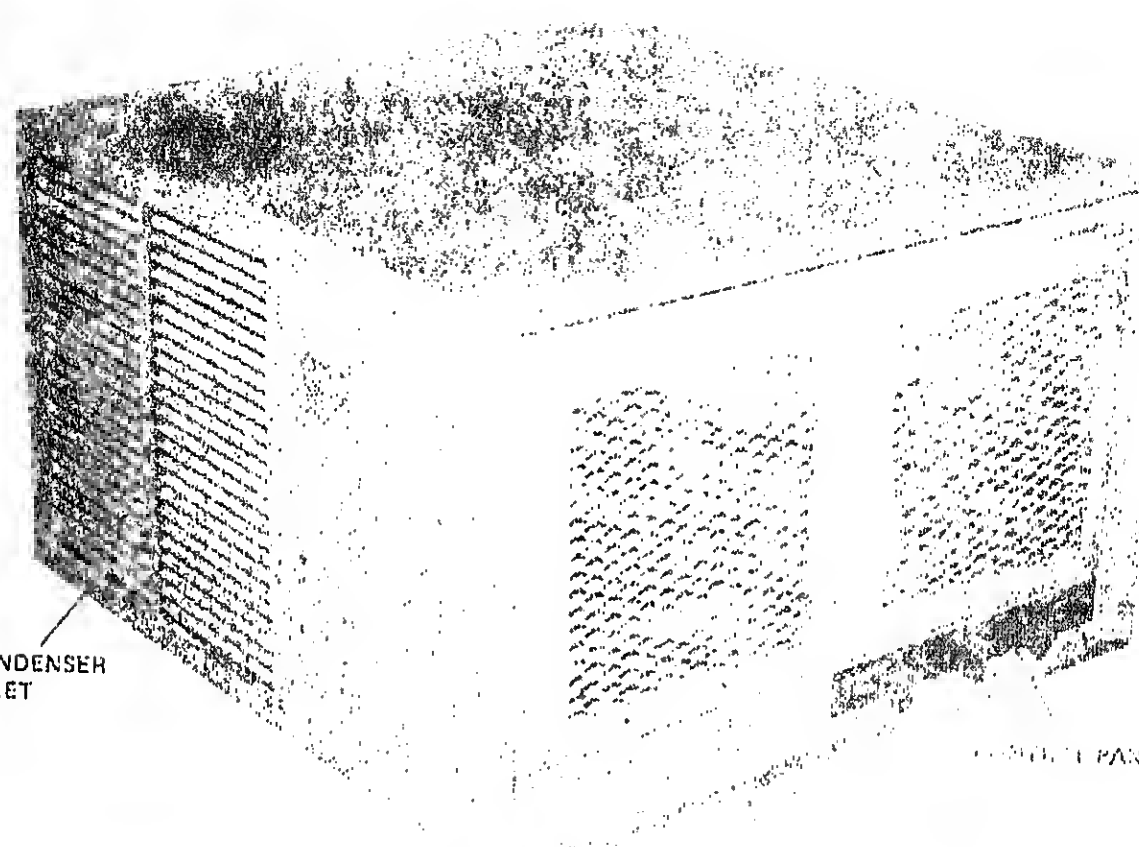
# **Section II. DESCRIPTION AND DATA**

## **. Description**

*a. General.* Air conditioner Model HAC-750H (figs. 1-1 thru 1-4) is a floor-mounted, self-contained electric motor driven unit designed for cooling

air to desired pre-determined range and circulating the conditioned air to provide cooling of equipment and personnel within the air conditioned area.



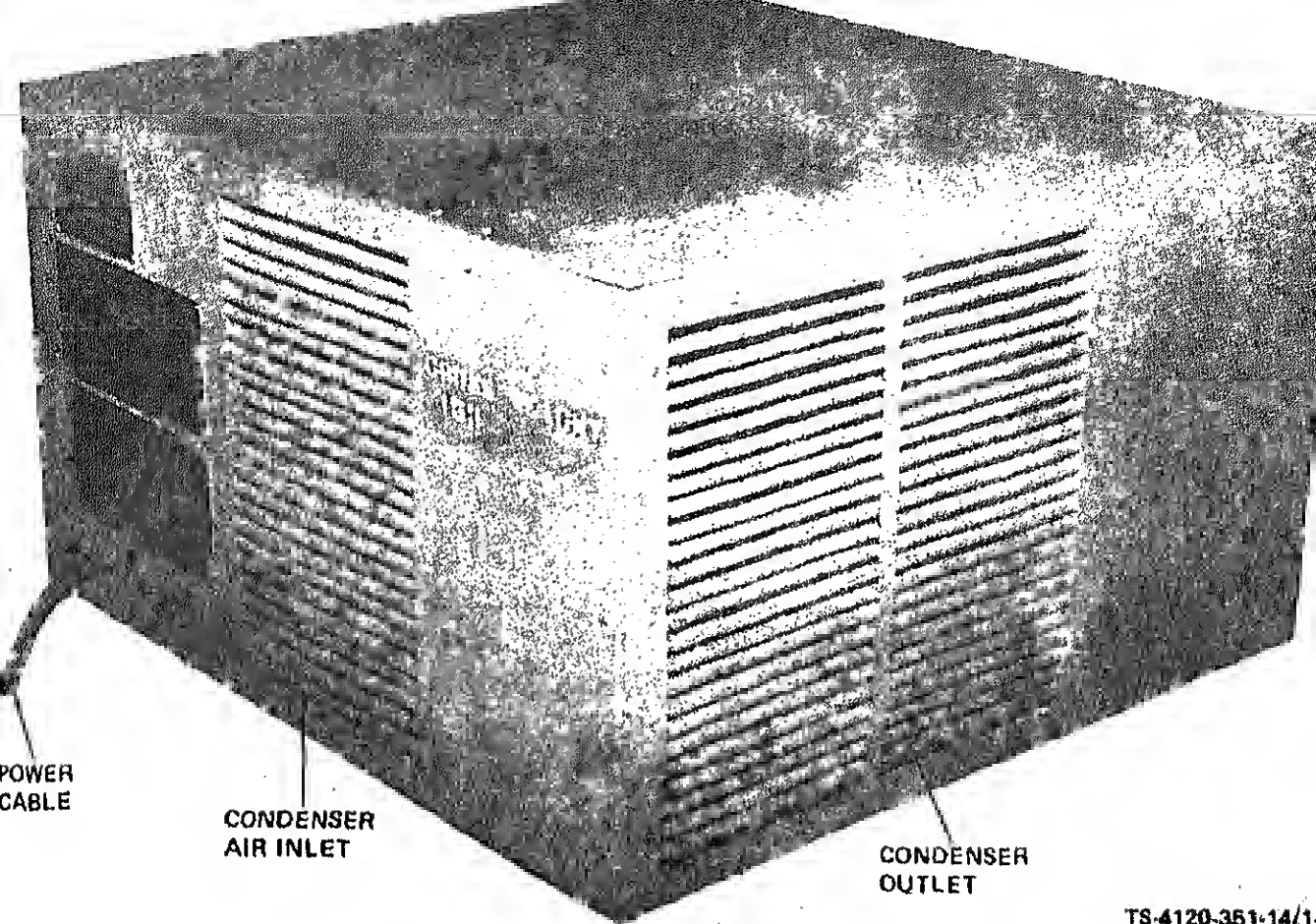


CONDENSER  
INLET

CONDENSER PANEL

CONDENSER PANEL

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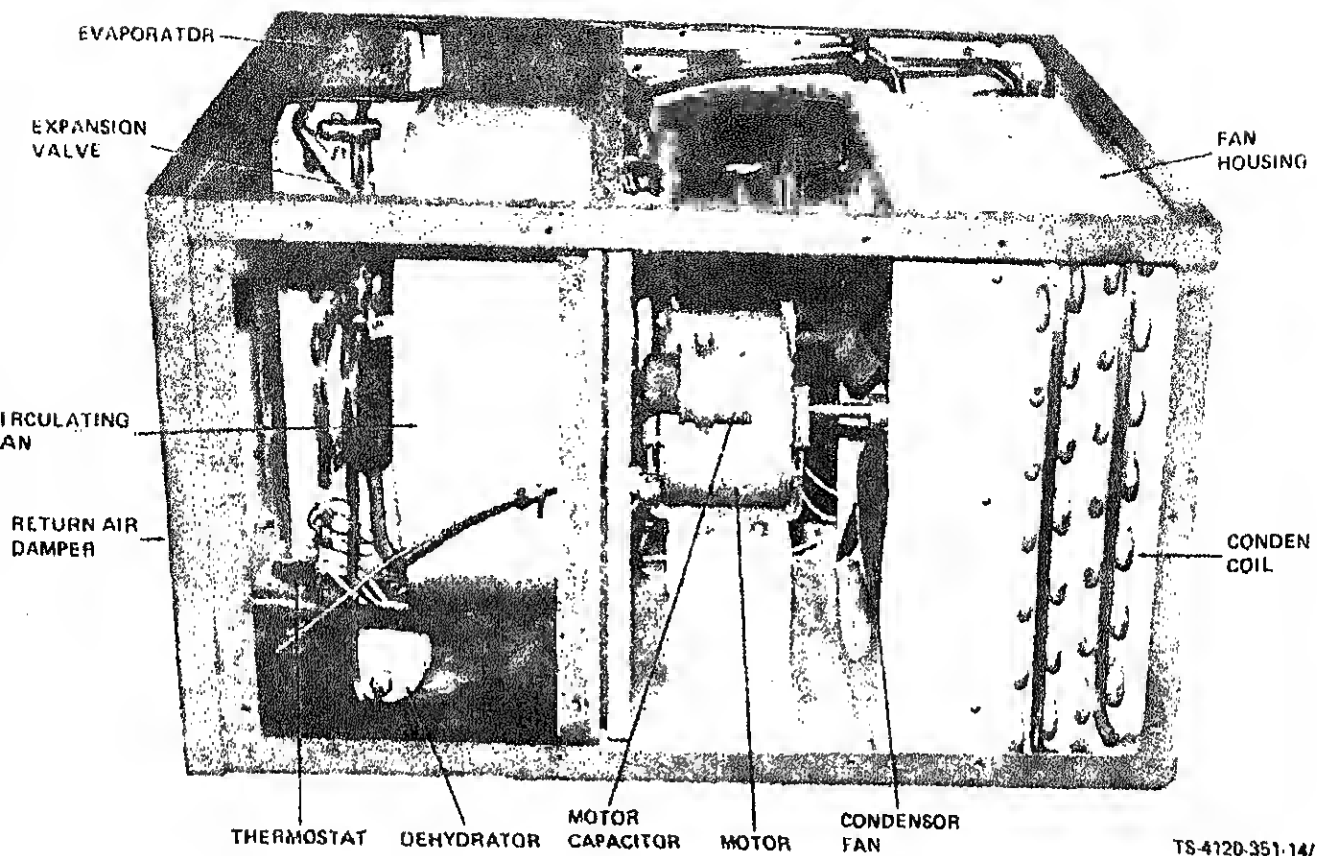


POWER  
CABLE

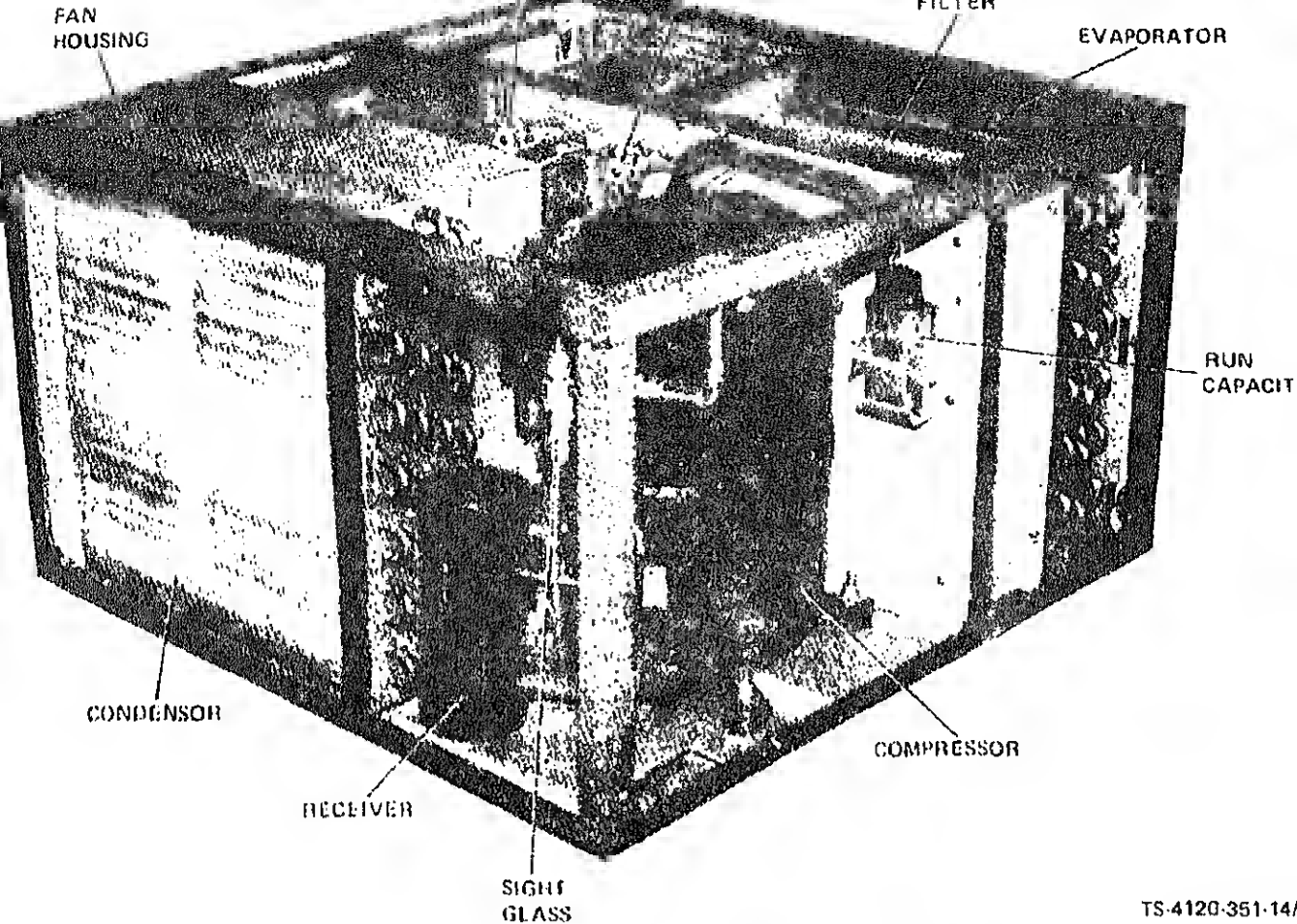
CONDENSER  
AIR INLET

CONDENSER  
OUTLET

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*Figure 1-3. Air conditioner, right top view, with panels removed.*



TS-4120-351-14

*Figure 1-4. Air conditioner, left rear, 3/4 view, panels removed.*

**b. Evaporator Section.** The evaporator section contains the evaporator coil, fan motor and fan, air filter, and thermal expansion valve. When cooling, air in the evaporator section is forced over the evaporator coil by the evaporator fan which lowers the temperature of the air before it is distributed into the space to be conditioned.

**c. Condenser Section.** The condenser section contains the hermetically sealed motor compressor, condenser coil, condenser fan and motor, service valves and the necessary refrigerant. The compressor mechanically compresses refrigerant vapor to a condensing condition and discharges it into the

## 1-7. Identification and Tabulated Data

**a. Identification.** The air conditioner has one major identification plate mounted on the side of the unit. The plate specifies nomenclature, manufacturer, manufacturer's model and serial number, military part number, BTU/HR, phase, Hertz, voltage, serial number, contract number, and shipping weight.

### **b. Tabulated Data.**

#### **(1) Air Conditioner (Model HAC-750H).**

Nomenclature.....Air conditioner, floor mounted

Volts.....115  
Hertz.....50/60  
Phase.....Single  
Weight (with oil).....70 pounds

### (3) Fan Motor (B2).

Manufacturer.....Dayton Electric Mfg. Co.  
Model.....3M064A (Modified by  
marking "97403  
13221E4583")  
Volts.....115  
Hertz.....60  
Phase.....Single  
RPM.....1250/1550  
Horsepower.....1/4  
Duty.....Continuous  
Motor Drive.....Direct  
Thermal Protector.....Automatic reset type  
open at 165°C (329°F)  
Rotation (facing lead  
end.....Counterclockwise

### (4) Start Capacitor (C1).

Manufacturer.....Cornell Dubilier  
Electronics  
Part Number.....ETW460-125 (modified  
by marking "97403  
13221E4581")  
Type.....Fixed aluminum  
electrolytic  
Capacitance.....500 mfd  $\pm$  8%  
Working Voltage.....125 Vac

### (5) Run Capacitor (C2).

Manufacturer.....General Electric Co.  
Part Number.....21L3007  
Type.....Fixed paper  
Capacitance.....7.5 mfd  
Working Voltage.....370

### (6) Motor Capacitor (C3) (Supplied as part of motor).

Manufacturer.....P. R. Mallory  
Part Number.....32BF3703  
Capacitance.....3 mfd

Type.....C-Stage  
Contacts Open.....140-153 volts at  
(95°F), 150-160 vo  
95°C (203°F)  
Contacts Close.....20-45 volts

### (8) Rotary Selector Switch (S1).

Manufacturer.....Oak Industries, Inc.  
Part Number.....240T6HPC (modifi  
marking "9  
13221E4549")  
Type.....SPDT  
Number of Switch  
Positions.....3

### (9) Thermostat (S2).

Manufacturer.....Ranco  
Part Number.....A30-1792 (modifi  
marking "9  
13221E4554")  
Type.....SPST, normally clo  
Contacts Close  
(temp. rise).....87°F-93°F (30.  
33.9°C)  
Contacts Open  
(temp. drop).....69°F-71°F (20.  
21.7°C)

### (10) Expansion Valve.

Manufacturer.....The Singer Co., Co  
Division  
Part Number.....138-70207 (modifi  
marking "9  
13221E4574")  
Inlet.....1/4 ODF  
Outlet.....1/2 ODF  
Cap. Tube Length.....60 in. (1,524 mm.)  
Nominal Capacity.....1/2 ton  
Superheat (factory set)....8 1/2°F-9 1/2°F at a  
bath temperature (  
12.5°C at a 0°C  
temperature)

### (11) Refrigerant Service Valves.

Manufacturer.....Robinair

**(12) Sight Glass.**

Manufacturer..... Mueller Brass Co.  
Part Number..... A15966 (modified by  
marking "97403  
13221E4548")

**(13) Dehydrator.**

Manufacturer..... Sporlan  
Part Number..... CO-52 (modified by mark-  
ing "97403 13214E3557")

Weight.....175 lbs. (79.38 kg.)

**1-8. Diagrams**

**a. Wiring Diagram.** Refer to figure FO-1  
(located in back of manual) for the wiring diagram.

**b. Refrigeration Diagram.** Refer to figure  
for the refrigeration diagram.



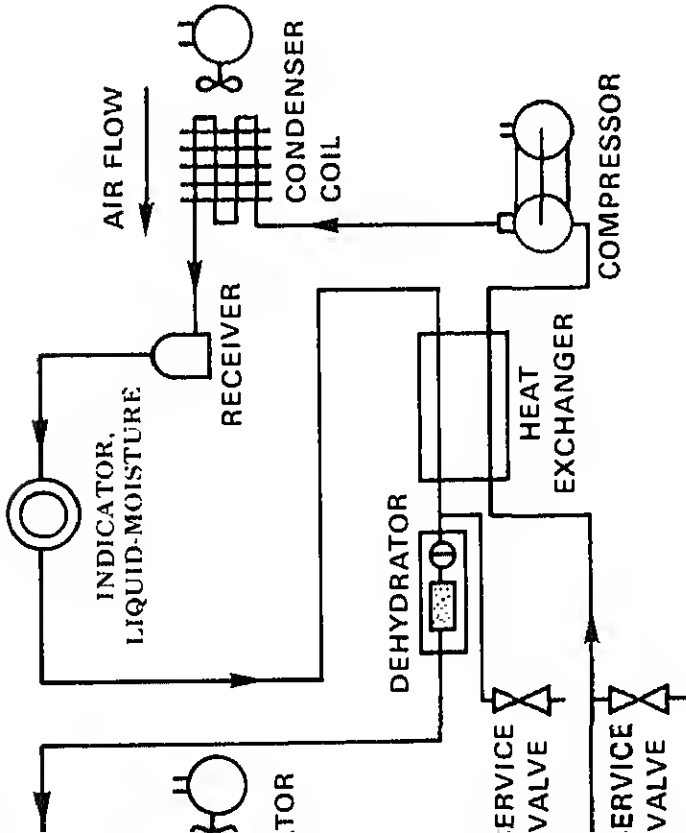


Figure 1-6. Refrigeration diagram.

COMPONENT REFERENCE LIST	
DESCRIPTION	PART NO
COMPRESSOR	13221E4555
CONDENSER COIL	13221E4533
EVAPORATOR COIL	13221E4533
EXPANSION VALVE	13221E4577
DEHYDRATOR	13214E3555
RECEIVER	13221E4533
SERVICE VALVE	13219E9499
SERVICE VALVE	13219E9499
INDICATOR, LIQUID-MOISTURE	13221E4566

REFRIGERANT CHARGE  
3 lb R 12





## WARNING

If equipment fails to operate, refer to troubleshooting procedures in Chapter 3.

### Section I. OPERATING INSTRUCTIONS

#### 2-1. Controls and Instruments

This section describes, locates and illustrates the various controls and instruments and provides the operator/crew sufficient information to insure

proper operation of the air conditioner. The location and the function of the controls and instruments are illustrated in figure 2-1.

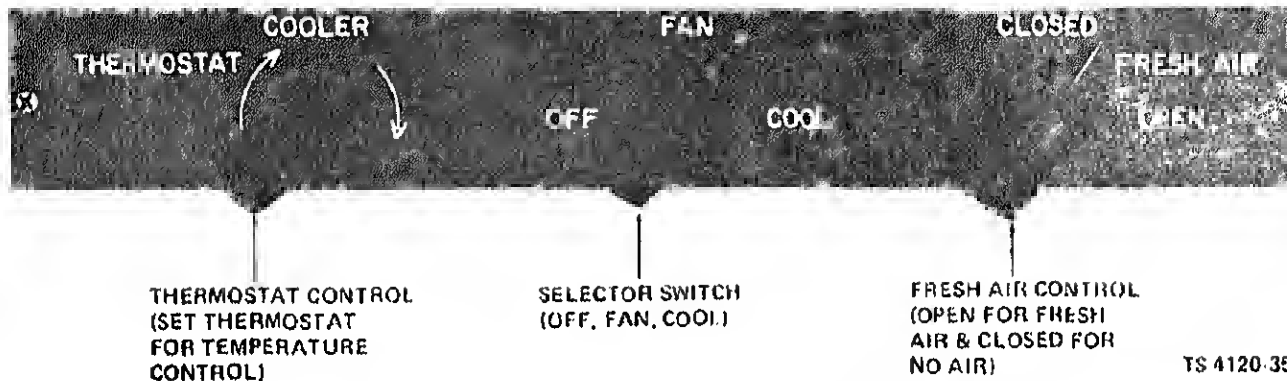


Figure 2-1. Controls and Instruments.

#### 2-2. Operating Instructions

a. The instructions in this section are published for the information and guidance of the personnel responsible for the operation of the air conditioner.

b. The operator must know how to perform every operation of which the air conditioner is capable. This section gives instructions on starting and stopping the air conditioner, and detailed operating instructions. Since nearly every condition presents a different problem, the operator may have to vary the given procedure to fit the condition.

##### c. Preparation for Starting.

(1) Perform the daily preventive maintenance checks and services (para. 3-6).

(2) Connect the main power cable.

(3) Check drain holes to insure that they are open.

(4) Be sure the unit is firmly secured.

are open and free of obstructions.

##### d. Operating Instructions.

(1) Set THERMOSTAT (fig. 2-1) to temperature.

##### NOTE

Only the COOLER position for the thermostat is marked on the front panel.

(2) Place selector switch in the FAN position to start fans.

(3) Place selector switch in the COOL position. When the temperature in the area is that of the THERMOSTAT setting the air conditioner will operate.

#### 2-3. Stopping Instructions

To stop the air conditioner, place selector switch in the OFF position.

ds of operation at extended temperatures may cause condenser or condenser fan motor to overheat and trip their internal overload switches or the high pressure cutout switch will shut the unit off.

**b. Filters.** To maintain the highest capacity of the unit, the return air filter and fresh air screen should be cleaned weekly or more often if necessary. Dirty filters reduce the flow of air across the evaporator coil, thereby reducing the capacity of the air conditioner.

**c. Grills and Louvers.** Keep all grills and louvers clean and free of any obstructions to maintain full air flow through the air conditioner.

**d. Coils.** Clean evaporator and condenser coils as frequently as necessary to prevent dirt or other matter from obstructing the air flow.

## **2-5. Operation in Dusty or Sandy Areas**

**a. Protection.** Shield the air conditioner from dust as much as possible. Take advantage of any natural barriers which offer protection.

**b. Cleaning.** Keep the air conditioner as clean as possible. Pay particular attention to the louvers, filters, coils, electrical components and grills. Use compressed air, if available, to aid in cleaning.

### **c. Air Filters and Coils.**

(1) Under extremely dusty or sandy conditions, the louvers, coils, electrical components and grills must be serviced more often.

### **NOTE**

*Never operate the unit without having the air filters in place.*

Take special precautions to keep equipment dry. If installed outdoors, cover the equipment with a waterproof cover when it is not in use. Remove cover during dry periods. Take all necessary precautions to keep the electrical components free from moisture.

## **CAUTION**

**Make sure power is disconnected from air conditioner before touching any wiring or other electrical parts.**

## **2-7. Operation in Salt Water Areas**

**a. General.** Wash the exterior and condenser section of the unit, particularly condenser air discharge louver control mechanism, with clean fresh water at frequent intervals. Be careful not to damage electrical system with water. Special attention must be given to prevent rust and corrosion.

## **WARNING**

**Disconnect power source prior to washing the air conditioner.**

**b. Painting.** Paint all exposed areas where paint has cracked, peeled, or blistered or report condition to organizational maintenance. Coat all exposed areas of polished metal with a light coat of grease.

## **Section I. LUBRICATION**

### **3-1. Fan Motors**

The fan motor is permanently lubricated by the manufacturer and requires no additional lubrication.

### **3-2. Compressor**

The compressor and compressor motor are fully lubricated by the manufacturer and require no additional lubrication.

## **Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES**

### **3-3. General**

To insure that the air conditioner is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded, to-

gether with the corrective action taken, on DA Form 2404 at the earliest possible opportunity.

### **3-4. Preventive Maintenance Checks and Services**

This paragraph contains a tabulated listing of preventive maintenance checks and services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to Table 1 for the preventive maintenance checks and services.

Table 3-1. Operator/Crew Preventive Maintenance Checks and Services

## NOTE

Within designated interval, these checks are to be performed in the order listed.

## Before

Item No.	Interval	Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment Not Ready Available
	B			
1	●	Grills	Check air diffuser grill and return air grill for dirt and obstructions. Check for loose or damaged parts.	
2	●	Housing Panels	Check for dirt and for loose or damaged parts.	
3	●	Drains	Check drains for obstructions. Remove obstructions as required.	

### 3-5. General

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the air conditioner. Each malfunction for an individual component, unit or system is followed by a list of tests or inspections which will help you to determine probable causes and corrective actions to take. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

c. The table lists the common malfunctions which you may find during the operation or maintenance of the air conditioner or its components. You should perform the tests/inspections and corrective actions in the order listed.

Table 3-2. Troubleshooting

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#### Malfunction

#### Test or Inspection

#### Corrective Action

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### 1. AIR CONDITIONER FAILS TO OPERATE

- Step 1.* Check to see if main power cable is disconnected.  
Connect main power cable to power receptacle connector.
- Step 2.* Check to see if selector switch is in OFF position.  
Place selector switch in FAN or COOL position.

### 2. INSUFFICIENT COOLING

- Step 1.* Check to see if selector switch is in COOL position.  
Place selector switch in COOL position.
- Step 2.* Check to see if THERMOSTAT is in COOLER position.  
Place THERMOSTAT in COOLER position.
- Step 3.* Inspect return air and air diffuser grills for obstructions. Remove any obstructions from return air and air diffuser grill (para. 3-7).
- Step 4.* Inspect refrigerant in air conditioner.  
Observe refrigerant charge through sight glass (para. 3-9).

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## Section IV. MAINTENANCE PROCEDURES

### 3-6. General

This section contains maintenance procedures for the operator of the air conditioner.

### 3-7. Grills and Panels

Remove any obstructions. Brush off loose dirt and wipe clean.

### 3-8. Drains

### 3-9. Sight Glass

Wipe refrigerant sight glass with a soft clean cloth. Set controls at increase and cool and operate unit for 15 minutes before observation. Yellow appearance indicates moisture in system and bubbles or milky flow indicate low refrigerant charge. Report presence of these conditions to direct support maintenance.



## Section I. SERVICE UPON RECEIPT OF MATERIEL

### 4-1. Inspecting and Servicing Equipment

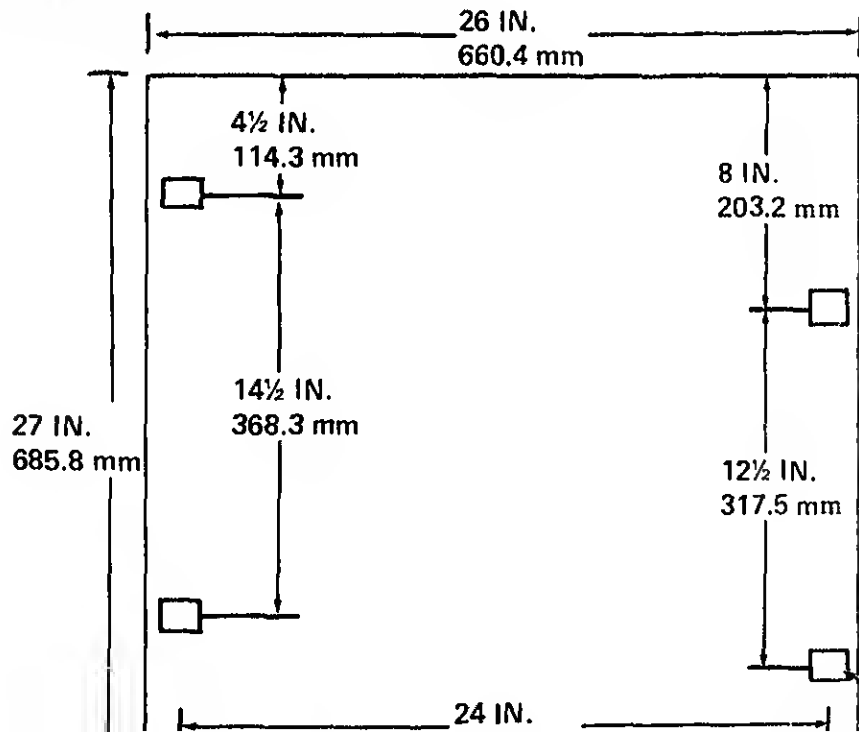
**a. Inspection.** Inspect the entire air conditioner for signs of damage, missing or loose hardware, and any defects that may have been incurred during shipment. Make a thorough check to see that all wiring, lines, and tubing are secure; and pay particular attention to the evaporator and condenser coils and main power receptacle. Be sure that visible wiring and insulation is not frayed or broken. Check the fan motor. If possible damage has occurred, requiring removal of covers or other components not authorized for removal by the operator, further inspection of internal components is to be performed by organizational maintenance personnel. If other than new equipment has been received, a thorough inspection is to be performed.

**b. Servicing.** Remove and inspect return air filter and fresh air screen and service filter.

### 4-2. Installation

**a. General.** The air conditioner is shipped assembled and ready for operation. It contains a full charge of refrigerant and compressor oil. Install the air conditioner in a van, shelter, or any room through an opening 15-7/8 inches high X 26-1/4 inches long or connect to a space through ducts. Be sure the air conditioner is installed so there is no restriction on the air flow, so that return air will collect the greatest amount of warm air in the space to be cooled, and so as not to interfere with personnel working on or operating the equipment.

**b. Mounting.** Brace the air conditioner with brackets to resist shock using two threaded holes in the bottom of the air conditioner. Mounting hole dimensions are shown on figure 4-1.





- b. Disconnect drain hose.
- c. Remove the unit from its mounting.
- d. Pack unit in original container, if available,

#### **4-4. Reinstallation After Movement**

Refer to paragraph 4-2.

### **Section III. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT**

#### **4-5. Tools and Equipment**

Refer to Appendix C for tools, equipment and repair parts issued with the air conditioner.

#### **4-6. Special Tools and Equipment**

No special tools or equipment are required for maintenance of the air conditioner.

#### **4-7. Maintenance Repair Parts**

Repair parts and equipment are listed and illustrated in the repair parts and special tool list covering organizational maintenance for this equipment (TM 5-4120-351-24P).

### **Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES**

#### **4-8. General**

Periodic maintenance checks are required by organizational maintenance personnel to check the performance of daily preventive maintenance services. Additional periodic maintenance services are required that are beyond the scope of the operator's maintenance.

#### **4-9. Quarterly Preventive Maintenance Services**

- a. This paragraph contains a tabulated listing of

preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to three calendar months, or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of inspection and minimum requirements. Refer to Table 4-1 for quarterly preventive maintenance.

c. Some services are required at a shorter interval and are so noted. Service intervals should be shortened under extreme or unusual conditions.

Q-Quarterly

A-Annually

Item No.	Interval		Item to be Inspected	Procedures
	Q	A		
1	●		Air Filter and Gaskets	<p>Check for damage. Clean the air filter (para 5-26).</p> <p>NOTE</p> <p>Ensure the following grill and panels have been removed (para 4-13, 4-14, 4-16, 4-17, 4-18, 4-19, and 4-20): air diffuser grill, right side panel, top front panel, top center panel, top rear panel, rear panel, and left side panel.</p>
2	●		Fan Motor	Check for loose, damaged, or dirty parts.
3	●		Fans	Check condenser fan and circulating fan for dirt and damage.
4	●		Wiring	Check electrical wiring for improper connections, looseness, and damage.
5	●		Coils	Check evaporator coil and condenser coil for dirt, leaks, and damage. Remove scale and corrosion from the external portion of coils.
6	●		Expansion Valve, Piping, and Sensing Bulb	Check for leaks and for loose, damaged, or dirty parts. Check that the sensing bulb is completely covered with insulation tape.
7	●		Sight Glass	<p>With the air conditioner operating, check sight glass. Yellow appearance indicates moisture in the system and bubbles or milky flow indicate low refrigerant charge.</p> <p>NOTE</p> <p>Ensure all panels and grill are installed prior to further operation (para 4-13, 4-14, 4-16</p>

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the air conditioner. Each malfunction for an individual component, unit or system is followed by a list of tests or inspections which will help you to determine probable causes and corrective actions to take. You should perform the tests/inspections and corrective actions in the order listed.

may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or not corrected by listed actions, notify your supervisor.

c. The table lists the common malfunctions which you may find during the operation or maintenance of the air conditioner or its components. You should perform the tests/inspections and corrective actions in the order listed.

Table 4-2. Troubleshooting

## Malfunction

### Test or Inspection

### Corrective Action

## 1. AIR CONDITIONER FAILS TO OPERATE

*Step 1.* Check to see if main power cable is disconnected.

Connect main power cable to power receptacle connector.

*Step 2.* Check to see if power receptacle connector is defective.

Replace defective power receptacle connector.

*Step 3.* Check for loose electrical connections.

Tighten electrical connections.

*Step 4.* Remove right side control panel, three knobs and instruction plate. Tag and disconnect leads to selector switch. With selector switch in OFF position, use an ohmmeter and measure resistance between terminal with a copper bar and each of the other terminals. Verify that ohmmeter reads high resistance. Place selector switch in FAN position. Verify that high resistance is read on compressor terminal and low resistance on fan terminal. With selector switch in COOL position, measure resistance between the terminal with a copper bar and each of the other two terminals. Verify that low resistance is read at both terminals.

Replace selector switch if defective.

## 2. INSUFFICIENT COOLING

*Step 1.* Check refrigerant charge.

Report condition to direct support maintenance.

*Step 2.* Inspect condenser coil for cleanliness.

Remove rear panel. Scrub external portion of the condenser coil with a stiff bristle brush to remove scale and corrosion. Take care not to damage fins. Use compressed air to blow out loose material.

## WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees Fahrenheit.

*Step 4.* Inspect return air grill for bent or stuck louvers or return air grill stuck in closed position.

**Straighten bent louvers, open return air grill or replace damaged return air grill.**

*Step 5.* Check to see that circulating fan is securely mounted on motor shaft and that there is no indication of damage to circulating fan.

**Tighten setscrews in hub of circulating fan or replace damaged circulating fan.**

### **3. CIRCULATING OR CONDENSER FAN FAILS TO OPERATE**

*Step 1.* Check to see that main power cable is connected.

**Connect main power cable.**

*Step 2.* Remove right side panel. Disconnect motor electrical leads. Using a multimeter, set on low ohm scale, test fan motor for resistance. Use wiring diagram FO-1 (located in back of manual) to establish points for resistance test.

**If fan motor is damaged, replace fan motor.**

*Step 3.* Check circulating or condenser fan for damage or binding.

**Remove binding or replace damaged circulating or condenser fan.**

*Step 4.* Remove right side panel. Using a capacitor tester, test fan motor capacitor for continuity, leakage, and capacitance. The capacitor is rated at 3 microfarads and 370 volts.

**Replace fan motor capacitor if defective.**



#### **4. COMPRESSOR WILL NOT START**

- Step 1.* Remove top center panel. Tag and disconnect start relay electrical leads. Check for continuity between each pair of terminals. Lack of continuity indicates the start relay is defective.  
**Replace start relay if defective.**
- Step 2.* Inspect electrical connections and wiring.  
**Tighten loose electrical connections and repair defective wiring.**
- Step 3.* Check compressor for proper operation and damage.  
**Report condition to direct support maintenance.**

#### **5. COMPRESSOR STARTS BUT GOES OUT ON OVERLOAD**

- Step 1.* Remove right side panel. Disconnect motor electrical leads. Using a multimeter, set on low ohm scale, test fan motor resistance. Use wiring diagram figure FO-1 (located in back of manual) to establish points for resistance test.  
**Replace fan motor if defective.**
- Step 2.* Check compressor for proper operation and damage.  
**Report condition to direct support maintenance.**
- Step 3.* Remove right side panel. Check expansion valve for proper operation and damage.  
**Report condition to direct support maintenance.**

#### **6. EVAPORATOR AIR OUTPUT VOLUME LOW**

- Step 1.* Inspect return air and air diffuser grills for damage and cleanliness.  
**Clean and repair return air and air diffuser grills.**
- Step 2.* Remove air diffuser grill. Inspect evaporator coil for ice and cleanliness.  
**Scrub the external portion of evaporator coil with a stiff bristle brush to remove scale and corrosion. Take care not to damage the fins. Use compressed air to blow out loose material.**

### **WARNING**

**Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F (38°C.).**

**Wipe evaporator coil with a cloth with dry cleaning solvent P-D-680.**

- Step 3.* Remove right side panel. Inspect circulating fan for security of attachment and damage.  
**Tighten two set screws in hub of circulating fan. Replace circulating fan if damage is indicated.**
- Step 4.* Remove right side panel. Disconnect motor electrical leads. Using a multimeter, set on low ohm scale, test fan motor resistance. Use wiring diagram figure FO-1 (located in back of manual) to establish points for resistance test.  
**If above resistance test indicates fan motor is defective, replace fan motor.**

#### **7. CONDENSER AIR OUTPUT VOLUME LOW**

- Step 1.* Remove rear panel. Inspect condenser coil for cleanliness and damage.  
**Scrub the external portion of condenser coil with a stiff bristle brush to remove scale or corrosion. Take care not to damage fins. Use compressed air to blow out loose material.**

## WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F (38°C.).

Wipe condenser coil with a cloth dampened with dry cleaning solvent P-D-680. Replace condenser if damage is indicated.

- Step 2.** Remove front access panel. Disconnect electrical connector from left side of control box. Remove control box. With thermostat set below room temperature, measure for continuity with an ohmmeter between terminals. Resistance should be zero ohms. Move thermostat setting to a position above room temperature. Using an ohmmeter, verify that there is an open circuit across terminals.

If testing indicates that the thermostat is defective, replace thermostat.

- Step 3.** Remove right side panel. Inspect condenser fan for security of attachment and damage.

Tighten two setscrews in hub of condenser fan. Replace condenser fan if damage is indicated.

- Step 4.** Remove right side panel. Disconnect motor electrical leads. Using a multimeter, set on low ohm scale, test fan motor resistance. Use wiring diagram figure FO-1 (located in back of manual) to establish points for resistance test.

If above resistance test indicates fan motor is defective, replace fan motor.

## 8. EXCESSIVE NOISE

- Step 1.** Remove right side panel. Inspect evaporator fan for security of attachment.

Tighten two setscrews in hub of evaporator fan and any other loose mounting hardware.

- Step 2.** Remove right side panel. Inspect condenser fan for security of attachment.

Tighten two setscrews in hub of condenser fan and any other loose mounting hardware.

- Step 3.** Remove right side panel. Inspect fan motor for wear and damage.

Replace worn or damaged fan motor.

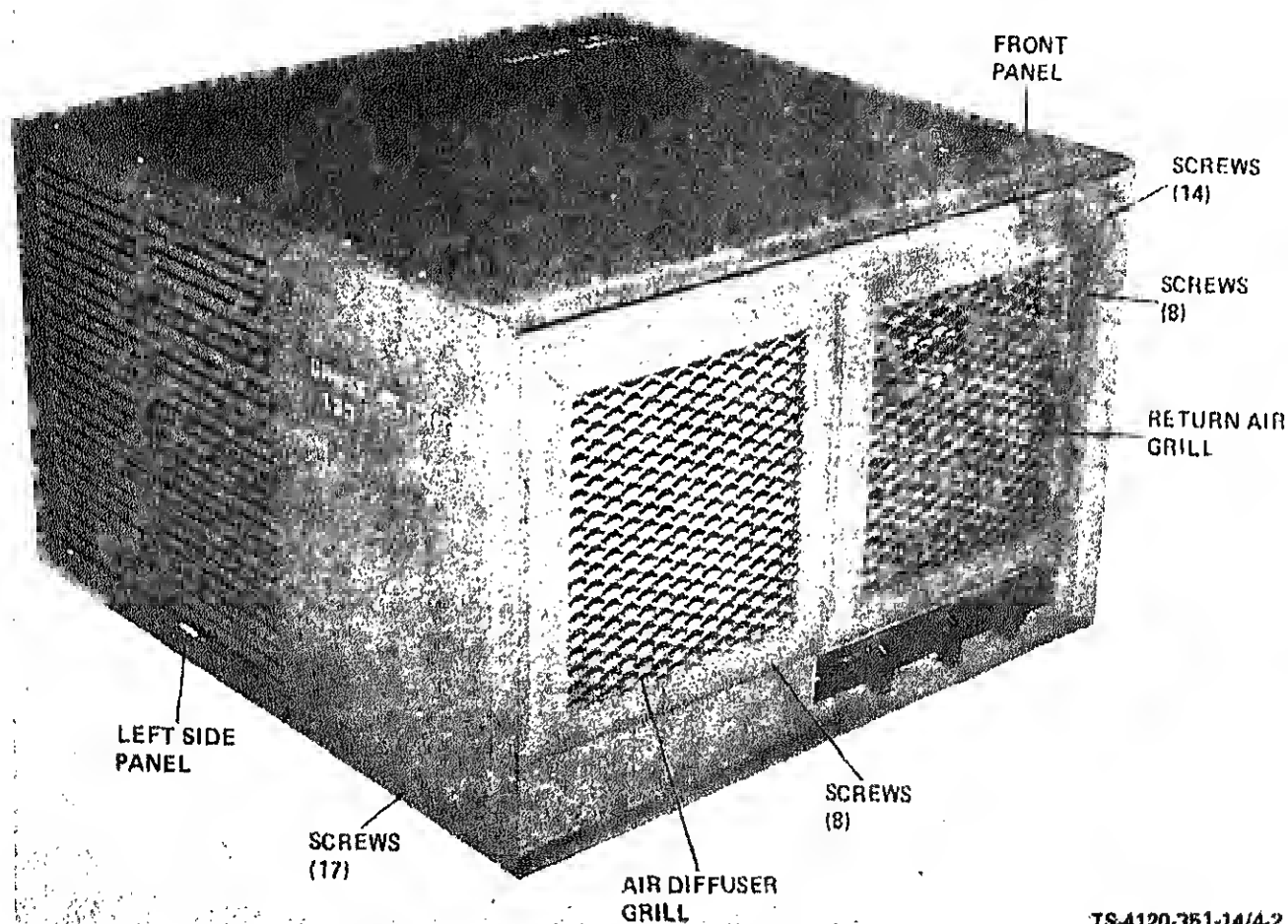
- Step 4.** Check to see if compressor is knocking or chattering.

Stop air conditioner and report condition to direct support maintenance.

---

#### 4-11. General

Refer to figures 4-2 and 4-3 for the location of grills and panels.



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*Figure 4-2. Grills and front and left side panels, removal and installation.*



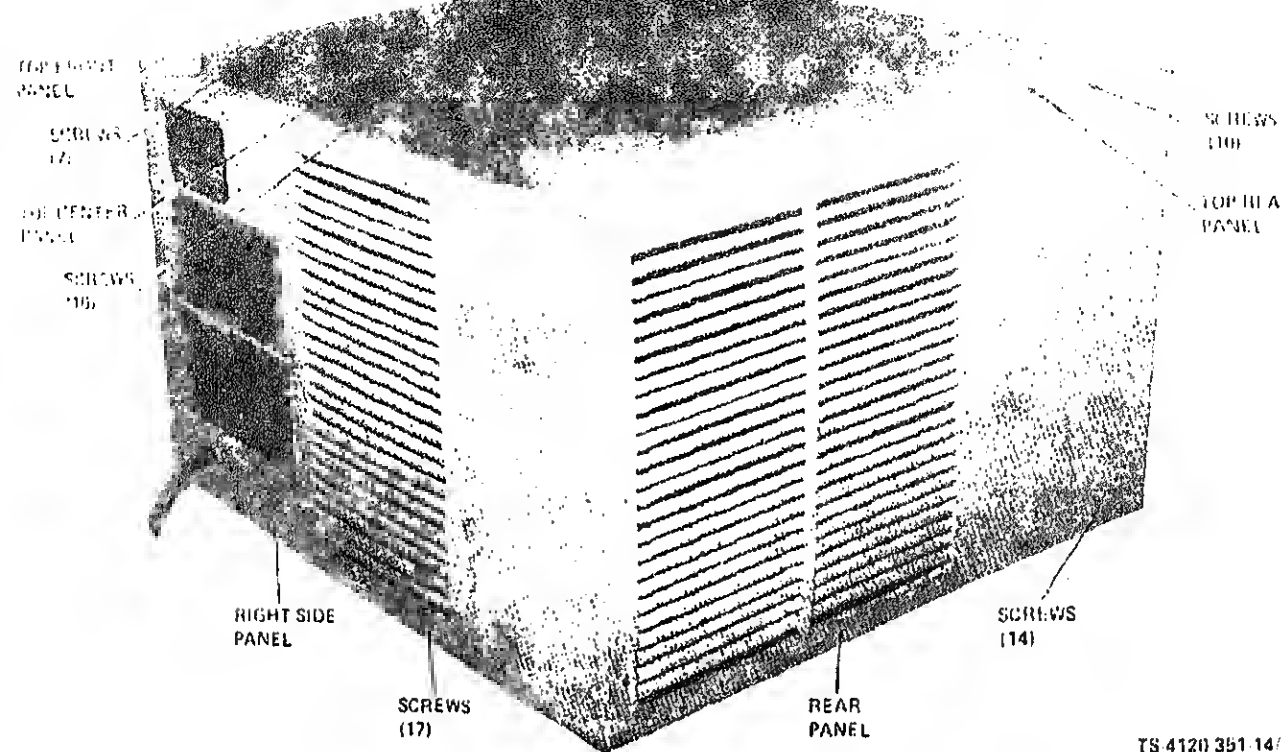


Figure 4-3. Top, rear and right side panels, removal and installation.

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#### 4-12. Return Air Grill

##### *Removal.*

(1) Remove right side panel (fig. 4-3) by removing 17 screws.

(2) Loosen mechanical screw post at rear of return air grill and remove wire.

(3) Remove return air grill (fig. 4-2) by removing eight screws.

*b. Repair.* Repair consists of straightening bent louvers.

##### *c. Installation.*

(1) Install return air grill and secure with eight screws.

(2) Install wire in mechanical screw post and then tighten mechanical screw post.

(3) Install right side panel (fig. 4-3) and secure with 17 screws.

*c. Installation.* Install air diffuser grill and secure with eight screws.

#### 4-14. Right Side Panel

*a. Removal.* Remove right side panel (fig. 4-3) by removing 17 screws.

*b. Repair.* Repair consists of straightening bent louvers.

*c. Installation.* Install right side panel and secure with 17 screws.

#### 4-15. Front Panel

##### *a. Removal.*

(1) Remove right side panel (fig. 4-3) by removing 17 screws.

(2) Loosen mechanical screw post at rear of return air grill and remove wire.

(3) Remove return air grill (fig. 4-2) by removing 8 screws.

**c. Installation.**

(1) Install front panel and secure with 14 screws.

(2) Install control panel plate and secure with two screws.

(3) Install knobs on thermostat switch, selector switch and fresh air control and tighten set-screws.

(4) Install return air grill and secure with eight screws.

(5) Install wire in mechanical screw post and tighten mechanical screw post.

(6) Install right side panel (fig. 4-3) and secure with 17 screws.

**4-16. Top Front Panel**

**a. Removal.**

(1) Remove top center panel (fig. 4-3) by removing ten screws.

(2) Remove top front panel by removing seven screws.

**b. Repair.** Repair consists of re-gluing or replacement of loose or defective gasketing.

**c. Installation.**

(1) Install top front panel and secure with seven screws.

(2) Install top center panel and secure with ten screws.

**4-18. Top Rear Panel**

**a. Removal.**

(1) Remove top center panel (fig. 4-3) by removing ten screws.

(2) Remove top rear panel by removing screws.

**b. Repair.** Repair consists of re-gluing or placement of loose or defective gasketing.

**c. Installation.**

(1) Install top rear panel and secure with screws.

(2) Install top center panel and secure ten screws.

**4-19. Rear Panel**

**a. Removal.** Remove rear panel (fig. 4-3) by removing 14 screws.

**b. Repair.** Repair consists of straightening louvers.

**c. Installation.** Install rear panel and secure with 14 screws.

**4-20. Left Side Panel**

**a. Removal.** Remove left side panel (fig. 4-3) by removing 17 screws.

**b. Repair.** Repair consists of straightening louvers.

**c. Installation.** Install left side panel and secure with 17 screws.

**Section VII. MAINTENANCE OF FANS**

**4-21. General**

The air conditioner is equipped with two fans. The condenser fan is an axial type that is mounted on one end of the double shafted condenser/circulating fan motor. The direction of rotation is clockwise when viewed from the rear of the air conditioner. The circulating fan is an impeller type centrifugal fan. The direction of rotation for the cir-

**4-22. Condenser Fan**

**a. Removal.**

(1) Remove right side panel (fig. 4-3) by removing 17 screws.

(2) Remove top center panel by removing screws.

(3) Loosen mechanical screw post at re-

(6) Loosen setscrews and remove knobs from fresh air control, selector switch and thermostat switch.

(7) Remove front panel by removing 14 screws.

(8) Remove either the four upper capscrews (fig. 4-4) and self-locking nuts or the four lower capscrews and self-locking nuts that secure the motor and motor mounting bracket to the air conditioner base.

(9) Remove blower intake ring (fig. 4-5) by removing seven screws.

(10) Loosen setscrew in hub of circulating fan and carefully remove circulating fan from the air conditioner.

(11) Slide motor (fig. 4-4) back against the air conditioner bulkhead.

(12) Loosen setscrew in hub of condenser fan and remove condenser fan.

#### ***b. Installation.***

(1) Position motor or motor mounting bracket

(3) Carefully install circulating fan and tighten setscrew in hub.

(4) Install blower ring (fig. 4-5) and secure with seven screws.

(5) Secure motor with four upper capscrews (fig. 4-4) and self-locking nuts.

(6) Install front panel and secure with fourteen screws.

(7) Install fresh air control knob, selector switch knob and thermostat switch knob and tighten setscrews.

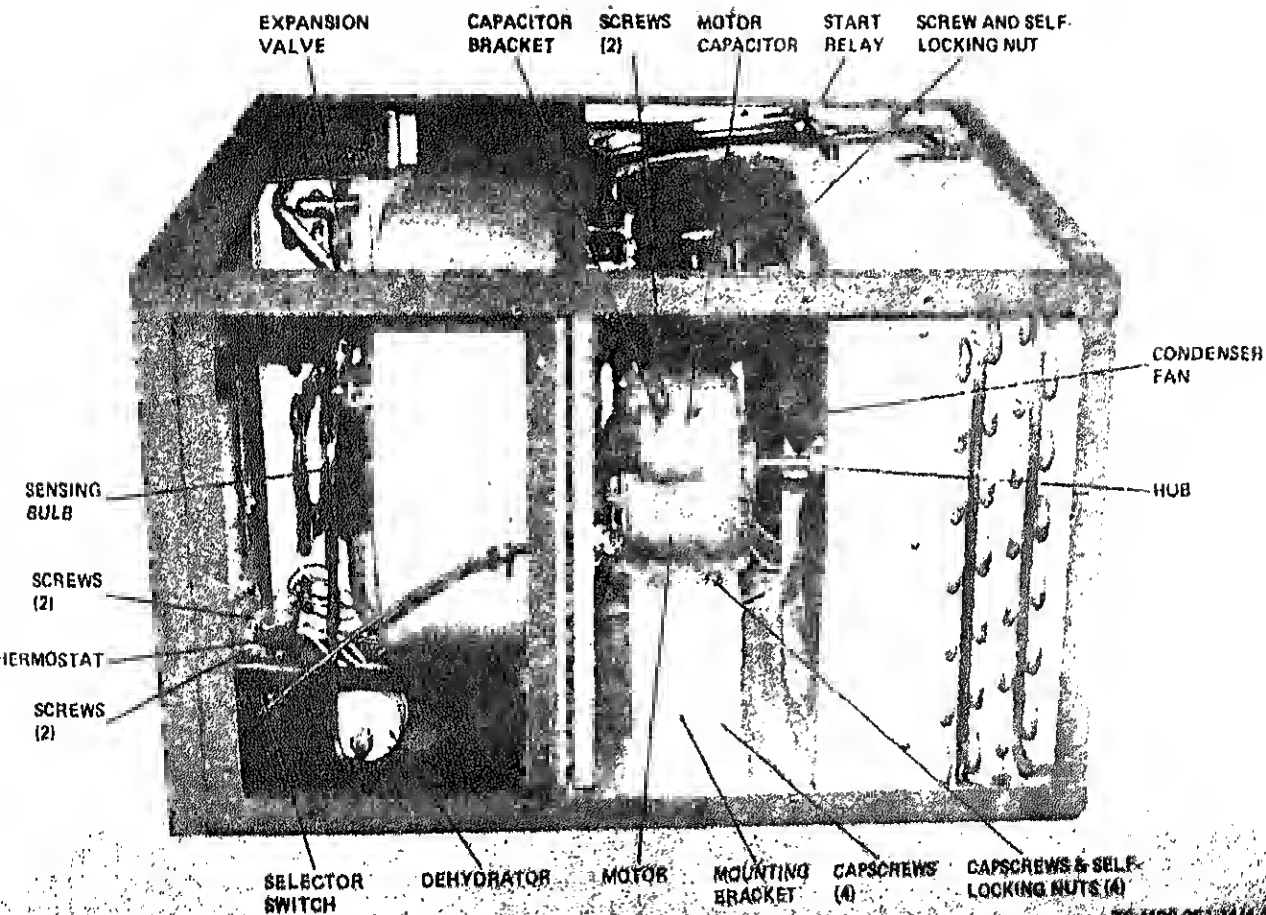
(8) Install air diffuser grill (fig. 4-2) and secure with eight screws.

(9) Install return air grill and secure with eight screws.

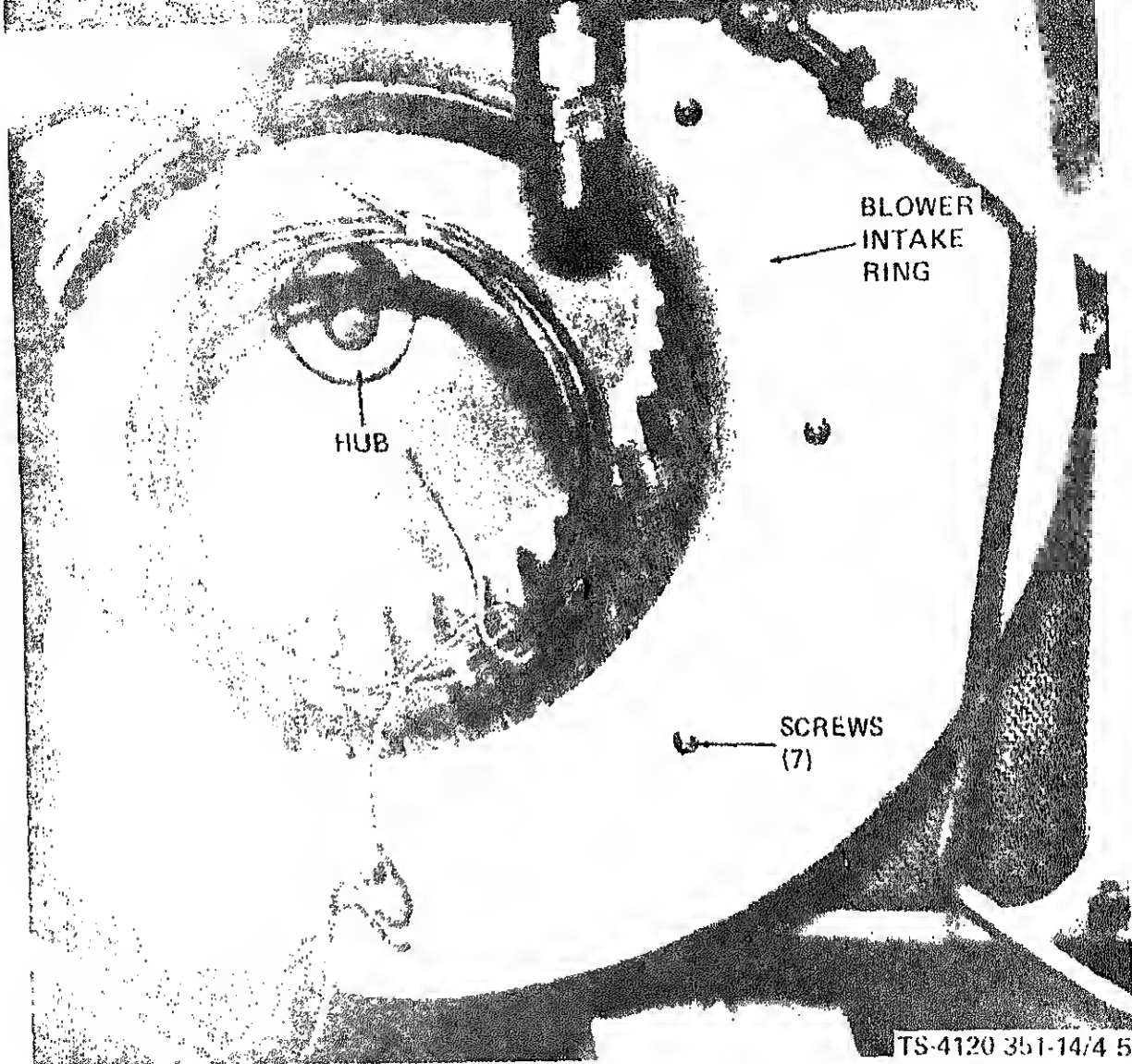
(10) Install wire in mechanical screw post and tighten mechanical screw post.

(11) Install top center panel (fig. 4-3) and secure with ten screws.

(12) Install right side panel and secure with seventeen screws.



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*Figure 4-5. Circulating fan removal and installation.*

#### 4-23. Circulating Fan

##### *a. Removal.*

(1) Remove right side panel (fig. 4-3) by removing 17 screws.

(2) Loosen mechanical screw post at rear of return air grill and remove wire.

(6) Remove front panel by removing 1 screws.

(7) Remove blower intake ring (fig. 4-5) by removing seven screws.

(8) Loosen setscrew in hub of circulating fan and carefully remove circulating fan from air conditioner.

(4) Install knob on fresh air control, selector switch and thermostat switch and tighten setscrews.

(5) Install air diffuser grill and secure with eight screws.

(7) Install wire in mechanical screw post, tighten mechanical screw post.

(8) Install top center panel (fig. 4-3) and secure with ten screws.

(9) Install right side panel and secure with screws.

## Section VIII. MAINTENANCE OF MOTOR

### 4-24. General

The condenser/circulating fan motor is a double shafted dual speed motor which drives both the condenser and circulating fans. The motor is mounted on a bracket between the evaporator and condenser compartments of the air conditioner.

### 4-25. Motor Testing

a. Remove right side panel (fig. 4-3) by removing 17 screws.

b. Using a multimeter set on low ohms scale, check for continuity between motor leads. The multimeter should indicate a low resistance across each pair of leads.

c. Connect one lead of the multimeter to the motor frame and the second lead to each of the motor leads. An indication of no resistance is evidence of a short in the motor and it must be replaced.

### 4-26. Motor Removal

a. Remove right side panel (fig. 4-3) by removing 17 screws.

b. Remove top center panel by removing ten screws.

c. Loosen mechanical screw post at rear of return air grill and remove wire.

d. Remove return air grill (fig. 4-2) by removing eight screws.

e. Remove air diffuser grill by removing eight screws.

f. Loosen setscrews and remove knobs from fresh air control, selector switch and thermostat control.

i. Remove blower intake ring (fig. 4-5) by moving seven screws.

j. Loosen setscrew in hub of circulating fan and carefully remove circulating fan from the air conditioner.

k. Slide motor (fig. 4-4) back against the air conditioner bulkhead.

l. Loosen setscrew in hub of condenser fan and remove condenser fan.

m. Tag and disconnect motor electrical leads and remove motor from air conditioner.

### 4-27. Motor Installation

a. Connect motor electrical leads to motor. Move tags.

b. Place motor or motor mounting bracket against bulkhead and slide motor back against air conditioner bulkhead.

c. Install condenser fan and tighten setscrew in hub.

d. Carefully install circulating fan and tighten setscrew in hub.

e. Install blower intake ring (fig. 4-5) and secure with seven screws.

f. Secure motor with four upper capscrews (fig. 4-4) and self-locking nuts.

g. Install front panel and secure with 14 screws.

h. Install fresh air control knob, selector switch knob and thermostat switch knob and tighten screws.

i. Install air diffuser grill (fig. 4-2) and secure with eight screws.

j. Install return air grill and secure with eight screws.

## 28. Selector Switch

**a. General.** The selector switch is used to select the mode of operation for the air conditioner. Modes available are OFF, FAN and COOL.

### **b. Testing.**

(1) Remove right side panel (fig. 4-3) by removing 17 screws.

(2) Tag and disconnect leads to the selector switch.

(3) Using an ohmmeter, measure the resistance between the related contacts at each switch setting.

(4) With selector switch in the OFF position the resistance indicated should be high; in the FAN position the compressor terminal should indicate high resistance and low resistance on the fan terminal and in the COOL position low resistance should be indicated.

### **c. Removal.**

(1) Remove right side panel (fig. 4-3) by removing 17 screws.

(2) Loosen setscrews and remove knobs (fig. 4-2) from fresh air control, selector switch and thermostat switch.

(3) Remove control panel plate by removing two screws.

(4) Remove two screws securing selector switch to front panel.

(5) Tag and disconnect electrical leads from selector switch and remove selector switch.

### **d. Installation.**

(1) Connect electrical leads to selector switch and install selector switch. Remove tags.

(2) Secure selector switch to front panel with two screws.

(3) Install control panel plate and secure with two screws.

(4) Install knobs on fresh air control, selector switch and thermostat switch and tighten setscrews.

## 4-29. Motor Capacitor

**a. General.** A motor capacitor is incorporated in the electrical circuit to improve the power factor, reduce motor currents, and supply the required starting torque for the fan motor.

**b. Testing.** Test the motor capacitor with a suitable capacitor tester for continuity, leakage and capacitance. The capacitor is rated at 3 microfarads, 370 volts.

### **c. Removal.**

(1) Remove right side panel (fig. 4-3) by removing 17 screws.

(2) Tag and disconnect electrical leads from motor capacitor (fig. 4-4).

(3) Remove motor capacitor and bracket by removing two screws.

### **d. Installation.**

(1) Install motor capacitor and bracket and secure with two screws.

(2) Connect electrical leads to motor capacitor and remove tags.

(3) Install right side panel (fig. 4-3) and secure with 17 screws.

## 4-30. Start Capacitor

**a. General.** A start capacitor is incorporated in the electrical circuit to improve the power factor, reduce motor currents, and supply the required starting torque for the compressor motor.

**b. Testing.** Test the start capacitor with a suitable capacitor tester for continuity, leakage and capacitance. The capacitor is rated at 500 microfarads, 125 volts ac.

### **c. Removal.**

(1) Remove left side panel (fig. 4-2) by removing 17 screws.

(2) Remove protective boot from start capacitor (fig. 4-6).

(3) Tag and disconnect electrical leads from start capacitor.

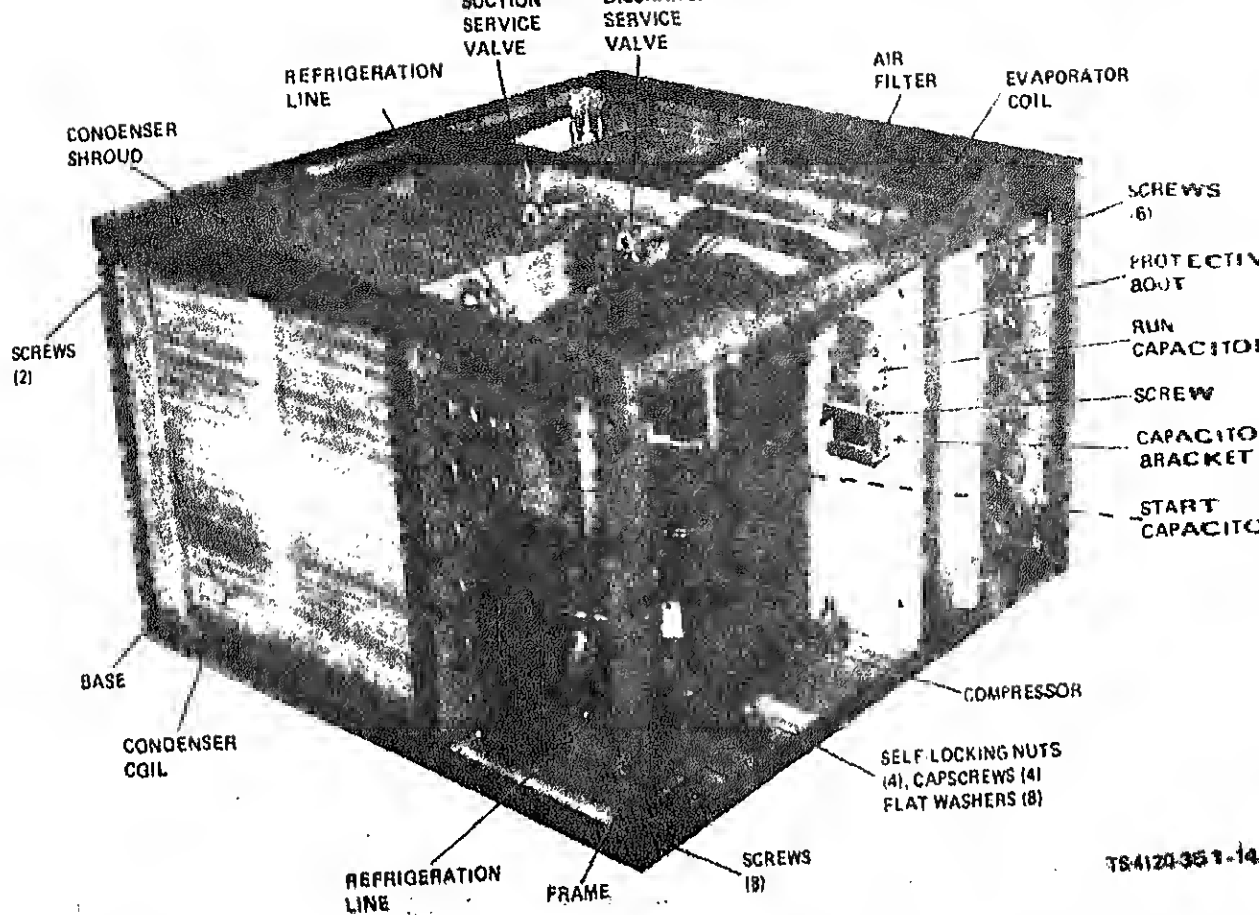


Figure 4-6. Service valves, capacitor, compressor, receiver, and liquid-moisture indicator, removal and installation

#### d. Installation.

(1) Install start capacitor in capacitor bracket and tighten screws.

(2) Connect electrical leads to start capacitor and remove tags.

(3) Install protective boot on start capacitor.

(4) Install left side panel (fig. 4-2) and secure with 17 screws.

#### 4-31. Run Capacitor

A run capacitor is incorporated in

the electrical circuit to improve the compressor motor characteristics.

b. Testing. Test the run capacitor with a suitable capacitor tester for continuity, leakage, and capacitance. The capacitor is rated 7.5 microfarads, 370 volts.

#### c. Removal.

(1) Remove left side panel (fig. 4-2) by moving 17 screws.

(2) Tag and disconnect electrical leads from run capacitor (fig. 4-6).



tainer.

#### *d. Installation.*

(1) Install run capacitor in capacitor retainer.

(2) Connect electrical leads to run capacitor and remove tags.

(3) Install left side panel (fig. 4-2) and secure with 17 screws.

### **4-32. Thermostat**

*a. General.* The thermostat is an adjustable, single pole, single throw switch that directs current to the cooling circuit of the air conditioner.

#### *b. Testing.*

(1) Remove right side panel (fig. 4-3) by removing 17 screws.

(2) Tag and disconnect leads to the thermostat (fig. 4-4).

(3) With the thermostat set below room temperature, use an ohmmeter and measure for continuity across the thermostat terminals. Resistance should be zero ohms.

(4) Move the thermostat setting to a position above room temperature. The resistance should be infinity.

#### *c. Removal.*

(1) Remove right side panel (fig. 4-3) by removing 17 screws.

(2) Loosen setscrews and remove knobs (fig. 4-2) from fresh air control, selector switch and thermostat.

(3) Remove control panel plate by removing two screws.

(4) Remove two screws securing thermostat (fig. 4-4) to front panel.

(5) Tag and disconnect electrical leads from thermostat and remove thermostat.

#### *d. Installation.*

(1) Connect electrical leads to thermostat and install thermostat. Remove tags.

(2) Secure thermostat to front panel with two

screws. (3) Install control panel plate (fig. 4-2) and secure with two screws.

(4) Install knobs on fresh air control, selector switch and thermostat and tighten setscrews.

(5) Install right side panel (fig. 4-3) and secure with 17 screws.

### **4-33. Start Relay**

*a. General.* The start relay is normally open and closes when the selector switch is placed in the COOL mode. When the start relay closes, power is provided to the compressor power circuit.

#### *b. Testing.*

(1) Remove top center panel (fig. 4-3) by removing ten screws.

(2) Remove top rear panel by removing nine screws.

(3) Tag and disconnect electrical leads from start relay (fig. 4-4).

(4) Using an ohmmeter, measure for continuity across the start relay terminals. Lack of continuity indicates a defective start relay.

#### *c. Removal.*

(1) Remove top center panel (fig. 4-3) by removing ten screws.

(2) Remove top rear panel by removing nine screws.

(3) Tag and disconnect electrical leads from start relay (fig. 4-4).

(4) Remove start relay from condenser shroud by removing one screw and self-locking nut.

#### *d. Installation.*

(1) Install start relay on condenser shroud and secure with one screw and self-locking nut.

(2) Connect electrical leads to start relay and remove tags.

(3) Install top rear panel (fig. 4-3) and secure with nine screws.

(4) Install top center panel and secure with ten screws.

Organizational maintenance of the compressor, piping and components is limited to cleaning, inspection and testing. Report any deficiencies to direct support maintenance.

#### 4-36. Compressor Testing

Test of the compressor consists of observation for normal operating pressures under cooling load, nor-

insulation resistance between the windings and the compressor frame should be not less than 60 megohms. The main winding (terminal pin A to B) should range between .6 to .8 ohms and the auxiliary winding (terminal pin A to C) should be between 5 and 7 ohms. The current and pressure should be as shown in Table 4-3.

Table 4-3. Normal Operating Pressures

Return air	90°F DB (32.2°C)	80°F (26.7°C)
to unit - °F Db and Wb	80°F Wb (26.7°C)	67°F Wb (19°C)
Outdoor Ambient Temperature - °F Db	125°F (51.6°C)	95°F (35°C)
Suction gage pressure	54-64	39-49
Discharge gage pressure	230-260	160-185

#### 4-37. Refrigerant Piping Testing

a. *Halide Torch Detector Leakage Test.* This is the preferred method of testing for leaks in the refrigerant system. Pass the exploring tube slowly over all sweat fittings, mechanical couplings and valves. If refrigerant is leaking from the system, the flame of the halide torch will change from blue to green when the leak is small. If the leak is large, the flame will be dense blue with a reddish tip; or a large leak may extinguish the torch. Mark all spots where leaks are noticed. Report all leaks to direct support maintenance.

b. *Soap Solution Leakage Test.* Brush all possible points of leakage with a soap solution and watch for soap bubbles. Follow a definite sequence so all points will be thoroughly tested. Wipe the soap solution from all joints and mark any spot where a leak occurs. Report all leaks to direct support maintenance.

#### 4-38. Evaporator Coil Cleaning and Testing

##### a. Cleaning.

(1) Remove air diffuser grill (fig. 4-2) by removing eight screws.

### WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F (38°C).

(2) Scrub the external portion of the evaporator coil (fig. 4-6) with a stiff bristle brush to remove scale and corrosion. Take care not to damage fins. Use compressed air to blow out loose material.

#### 4-39. Condenser Coil Cleaning and Testing

##### *a. Cleaning.*

(1) Remove rear panel (fig. 4-3) by removing 14 screws.

### **WARNING**

Dry cleaning solvent, P-D-680, used to

degrees F (38°C).

(2) Scrub the external portion of the condenser coil (fig. 4-5) with a stiff bristle brush to remove scale and corrosion. Take care not to damage fins. Use compressed air to blow out loose material. Wipe evaporator coil with a cloth dampened with dry cleaning solvent P-D-680.

# **MAINTENANCE INSTRUCTIONS**

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## **Section I. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT**

### **5-1. Special Tools and Equipment**

No special tools or equipment are required for maintenance of the air conditioner.

### **5-2. Maintenance Repair Parts**

Repair parts and equipment are listed and illustrated in the repair parts and special tool list covering direct and general support maintenance for this equipment (TM 5-4120-351-24P).

## **Section II. TROUBLESHOOTING**

### **5-3. General**

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the air conditioner. Each malfunction for an individual component, unit or system is followed by a list of tests or inspections which will help you to determine probable causes and corrective actions to take.

You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

eration and damage.

**LY**

erant.

remove top front panel. Slide air filter from air conditioner.

## **ARNING**

**D-680, used to clean parts is po-  
sonnel and property. Avoid re-  
in contact. Do not use near open  
Flash point of solvent is 100 de-**

vent P-D-680 and dry with clean, low pressure compressed air. Dip  
or oil per Specification MIL-L-2104, Grade 20 or better. Drain of

igerant.

hydrator is clogged or defective.  
hydrator.

valve for proper operation and damage.

valve for proper operation and damage.

hydrator is clogged or defective.  
hydrator.

---

## **6. LOW DISCHARGE PRESSURE**

Remove left side panel. Check to see if compressor is pumping.

**Replace defective compressor.**

## **7. LOW SUCTION AND DISCHARGE PRESSURE**

*Step 1.* Inspect sight glass for proper amount of refrigerant. Check refrigerant system for leaks

**Repair leaks and add refrigerant as necessary.**

*Step 2.* Remove right side panel. Inspect expansion valve for proper operation and damage.

**Replace defective expansion valve.**

---

## 5-5. Pressure Testing the Refrigerant System

*a. General.* A pressure test will indicate whether the air conditioner is operating at normal or abnormal pressures. When the air conditioner is not operating at normal pressure the cause should be ascertained and corrected. Refer to Table 5-1 for troubleshooting procedures.

### *b. System Pressure Test.*

(1) Remove top center panel (fig. 4-2) by removing ten screws.

(2) Unscrew and remove caps from discharge service valve (fig. 4-5) and suction service valve.

(3) Connect suction and discharge pressure gages to the respective fittings.

(4) Compare the gage readings with the normal range of system pressure shown in Table 5-2.

#### Operating Pressures

	80°F/67°F WB
WB)	(26.7°C/19.4°C WB)
	95°F (35°C)
	39-49
	160-185

## WARNING

Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas. Be especially careful that refrigerant -12 does not come in contact with eyes. In case of refrigerant leaks, ventilate area immediately.

## CAUTION

Personnel with history or other evidence of cardiac rhythm disturbances should be evaluated by local medical authorities before working in envi-

(1) Unscrew and remove cap from discharge service valve.

(2) Connect a cylinder of dry nitrogen to suction service valve.

(3) Attach a suitable discharge hose to discharge service valve.

(4) Open nitrogen cylinder valve and allow nitrogen to flow through system until all moisture is forced out.

(5) Close nitrogen cylinder valve.

(6) Connect a vacuum pump to suction service valve and discharge service valve and hold a 29.0" Hg vacuum for eight hours.

#### d. Charging the System.

##### NOTE

*Steps (1), (2) and (3) apply only to a completely evacuated system. To add additional refrigerant to a charged system, refer to steps (6) through (9).*

(1) Unscrew and remove cap from suction service valve and loosely connect charging line of refrigerant drum.

(2) Open refrigerant drum shutoff valve slightly to purge air from charging line. Close refrigerant drum shutoff valve and tighten connection at suction service valve.

(3) Set the refrigerant drum in an upright position on a scale so that only gaseous refrigerant will enter the system. Do not operate the air conditioner. Open refrigerant drum shutoff valve and charging valve and charge refrigerant system until system and refrigerant drum pressures have equalized or until 3.5 pounds of refrigerant have entered the system.

(4) Close valves and carefully loosen charging line to release trapped pressure. Disconnect charging line and install suction service valve cap. Operate air conditioner in cooling mode for 15 minutes.

(5) Check sight glass. If system is low on refrigerant, gas bubbles will appear regularly in the sight glass. If refrigerant system is undercharged, add additional refrigerant in accordance with steps

When adding refrigerant, use extreme care to avoid adding refrigerant to the system too fast which would cause slugging at the compressor.

(7) With the air conditioner operating, admit gas to system slowly (approximately one ounce per minute). Constantly observe refrigerant drum weight to insure that only 3.5 pounds total weight of refrigerant is in the system.

(8) Close valves and carefully loosen charging line to release trapped pressure. Disconnect charging line and install discharge service valve. Operate air conditioner in cooling mode for 15 minutes.

(9) Check sight glass and if bubbles are indicated repeat steps (6) through (9) adding refrigerant in 4 ounce increments until sight glass is clear.

#### 5-7. Testing for Refrigerant Leaks

a. *Halide Torch Detector Leakage Test.* This is the preferred method of testing for leaks in the refrigerant system. Pass the exploring tube slowly over all sweat fittings, mechanical couplings and valves. If refrigerant is leaking from the system, the flame of the halide torch will change from blue to green when the leak is small. If the leak is large, the flame will be dense blue with a reddish tip; or a large leak may extinguish the torch. Mark all spots where leaks are noticed. Discharge system (para. 5-6b), repair any leaks, purge (para. 5-6c) and recharge system (para. 5-6d).

b. *Soap Solution Leakage Test.* Brush all possible points of leakage with a soap solution and watch for soap bubbles. Follow a definite sequence so all points will be thoroughly tested. Wipe the soap solution from all joints and mark any spot where a leak occurs. Discharge system (para. 5-6b), repair any leaks, purge system (para. 5-6c) and recharge system (para. 5-6d).

#### 5-8. Removal of Refrigerant System Parts

It may be necessary to remove some tubing and fittings with a part that is to be replaced. The



1. cation QQ-S-561 per MIL-B-7883. Solder melting point is 1160°F (634.8°C). All brazed or soldered joints shall be made with an atmosphere of inert gas to prevent internal oxidation.

#### 5-10. Insulation and Gaskets

2. Replace damaged insulation and gaskets. Cement loose insulation.

#### 5-11. Hardware

3. Replace any damaged screws, washers, lock-washers, or nuts. Use screws of correct length to hold parts securely. In some applications screws that are too long may hit bottom before the head is tight against the part it is to hold or may cause damage to the threads or other parts.

#### 5-12. Shims

4. Be sure to remove all shims where used. Keep shims together and identify them as to location.

#### 5-13. Repairing Damaged Threads

Damaged threads should be repaired by use of a thread restorer or by chasing in a lathe. Internal threads should be repaired with a used tap of the correct size. If threads cannot be satisfactorily repaired, replace the part.

### Section IV. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

#### 5-18. General

5 This section covers removal of all major assemblies of the air conditioner which are the responsibility of the direct support and general support maintenance. The refrigerant piping and valves cannot be removed as a unit and only those parts that require replacement should be removed. Removal and installation instructions for individual valves and other components of the refrigeration system are contained in this section. Refer to paragraph 5-8 before performing maintenance on the refrigeration system.

faces so that the part will efficiently perform normal function. The finish of the repaired part should be approximately that of the original finish. After performing any of these operations, critical dimensions must not be altered.

#### 5-15. Removal of Rust or Corrosion

Remove corrosion from all parts of machine. To remove rust or corrosion, use a wire brush, sand cloth, sand blast, vapor blast equipment or sand mover except on highly polished surfaces. On polished surfaces, buffing or the use of crocus cloth is recommended.

#### 5-16. Tubes and Fitting

Check tubes and fittings for cracked or distorted condition. Check tubing and kinks. Replace damaged fittings. Replace damaged tubing with tubing of same size. Take care in making bends in tubing to prevent kinking of tubing. All tubing and fittings must be completely clean on inside prior to installation.

#### 5-17. Valves

Valves and other parts should be handled carefully to prevent damage. Capillary tubes should be handled very carefully to prevent kinking of tubes.

#### b. Removal.

(1) Remove top center panel (fig. 4) by removing ten screws.

(2) Remove top rear panel by removing ten screws.

(3) Remove left side panel (fig. 4) by removing 17 screws.

(4) Discharge refrigerant from system (see 5-6 b).

(5) Unscrew and remove two flare nuts. Remove refrigerant lines from compressor.

conditioner and secure compressor with four cap screws, eight flat washers, and four self-locking nuts.

(2) Reconnect refrigerant lines to compressor.

(3) Recharge refrigerant system per paragraph 5-6*d*.

(4) Install left side panel (fig. 4-2) and secure with 17 screws.

(5) Install top rear panel (fig. 4-3) and secure with nine screws.

(6) Install top center panel and secure with ten screws.

## 5-20. Decontamination

*a. General.* The compressor is a hermetically sealed unit and cannot be repaired. An inoperative compressor is usually due to a mechanical failure or motor burn out. If the compressor is mechanically frozen or sustains a motor burn out it must be replaced. A compressor failure generates high temperature causing a breakdown of oil and refrigerant with the resulting formation of acid, moisture or sludge. These products are extremely corrosive and must be flushed from the system or repeated burn outs will occur.

*b.* Discharge refrigerant system (para. 5-6*b*) and purge system with nitrogen (para. 5-6*c*).

*c.* Remove defective compressor (para. 5-19).

*d.* With compressor out of the system, purge all lines with dry nitrogen (para. 5-6*c*).

*e.* Install new compressor (para. 5-19).

*f.* Replace dehydrator (para. 5-23).

*g.* Recharge refrigerant system (para. 5-6*d*).

## 5-21. Evaporator Coil

### *a. Removal.*

(1) Remove right side panel (fig. 4-3) by removing 17 screws.

(2) Loosen mechanical screw post at rear of return air grill and remove wire.

(3) Remove return air grill (fig. 4-2) by re-

moving front panel by removing

(7) Remove left side panel by removing screws.

(8) Remove rear panel (fig. 4-3) by removing 14 screws.

(9) Remove top center panel by removing screws.

(10) Remove top front panel by removing seven screws.

(11) Remove top rear panel by removing screws.

(12) Remove two screws (fig. 4-6) from frame.

(13) Remove eight screws securing frame base and remove frame from base.

(14) Discharge refrigerant system (para. 5-6*b*).

(15) Remove two refrigeration lines and evaporator coil.

(16) Remove six screws securing evaporator coil.

(17) Remove four screws (fig. 5-1) from bottom of air conditioner and remove evaporator coil.

### *b. Installation.*

(1) Install evaporator coil in air conditioner and secure with four screws.

(2) Secure evaporator coil with six screws (fig. 4-6).

(3) Connect and solder two refrigeration lines to evaporator coil.

(4) Recharge refrigerant system (para. 5-6*d*).

(5) Install frame on base and secure with eight screws.

(6) Install two screws at top of frame.

(7) Install top rear panel (fig. 4-3) and secure with nine screws.

(8) Install top front panel and secure with seven screws.

(9) Install top center panel and secure

with two screws.

(14) Install knobs on thermostat switch, selector switch, and fresh air control and tighten setscrews.

tighten mechanical screw post.

(17) Install right side panel (fig. 4-3) and secure with 17 screws.

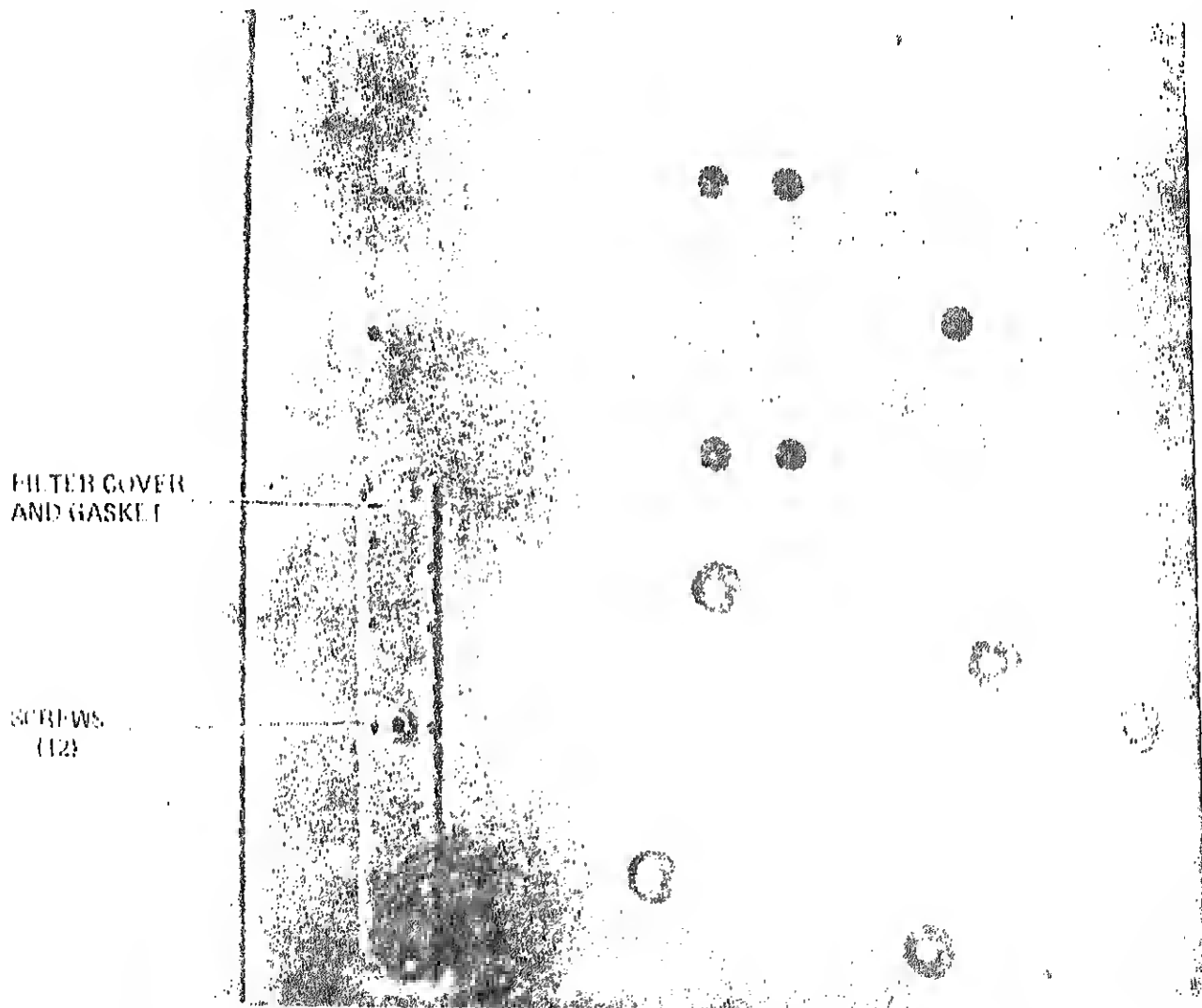


Figure 5-1. Air filter, removal and installation.

## 5-22. Condenser Coil

### a. Removal.

(1) Remove top center panel (fig. 4-3) by removing ten screws.

(2) Remove top rear panel by

moving 17 screws.

(5) Discharge refrigerant system (para. 5-6b).

(6) Remove top and bottom refrigeration lines (fig. 4-6) from condenser coil.

15 4120 351 14:5 1

and secure with four screws.

(2) Install condenser shroud (fig. 4-6) and secure with six screws.

(3) Install two screws at top of frame.

(4) Connect and solder two refrigeration lines to condenser coil.

(5) Recharge refrigerant system (para. 5-6d).

(6) Install left side panel (fig. 4-2) and secure with 17 screws.

(7) Install rear panel (fig. 4-3) and secure with 14 screws.

(8) Install top rear panel and secure with nine screws.

(9) Install top center panel and secure with ten screws.

### 5-23. Dehydrator

#### a. Removal.

(1) Remove right side panel (fig. 4-3) by removing 17 screws.

(2) Discharge refrigerant system (para. 5-6b).

(3) Unscrew two flare nuts from dehydrator (fig. 4-4) and remove refrigerant lines from dehydrator.

(4) Remove dehydrator from air conditioner.

#### b. Installation.

(1) Install dehydrator and reconnect refrigerant lines.

(2) Recharge refrigerant system (para. 5-6d).

(3) Install right side panel (fig. 4-3) and secure with 17 screws.

### 5-24. Sight Glass

#### a. Removal.

(1) Remove rear panel (fig. 4-3) by removing 14 screws.

(2) Discharge refrigerant system (para. 5-6b).

(3) Unscrew two flare nuts from sight glass

(3) Install rear panel (fig. 4-3) and secure with 14 screws.

### 5-25. Expansion Valve

#### a. Removal.

(1) Remove right side panel (fig. 4-3) by removing 17 screws.

(2) Remove top center panel by removing 10 screws.

(3) Remove top front panel by removing 10 screws.

(4) Discharge refrigerant system (para. 5-6b).

(5) Unwrap insulation tape from sensor (fig. 4-4).

(6) Unscrew floro nut and adapter from expansion valve and remove refrigerant lines from expansion valve.

(7) Remove expansion valve from oil separator.

### 5-26. Air Filter

a. *General.* The air filter is located below the evaporator coil. The air filter removes dust and contaminants from the air entering the evaporator compartment thus protecting the evaporator and other components from becoming fouled. For this reason it is very important that the air filter be inspected and cleaned regularly. The air filter may be removed from the air conditioner either from the top or the bottom.

#### b. Removal from the Top.

(1) Remove top center panel (fig. 4-3) by removing ten screws.

(2) Remove top front panel by removing 10 screws.

(3) Slide air filter (fig. 4-6) up and out of the air conditioner.

#### c. Removal from the Bottom.

(1) Remove filter cover (fig. 5-1) and secure with 12 screws.

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F (38°C).

Wash the air filter with dry cleaning solvent per Federal Specification P-D-680, and dry with clean, low pressure compressed air. Dip or spray the air filter with "Filter Kote" or oil per Specification MIL-

(1) Slide air filter (fig. 4-5) down into air conditioner.

(2) Install top front panel (fig. 4-3) and secure with seven screws.

(3) Install top center panel and secure with ten screws.

*g. Installation from the Bottom.*

(1) Slide air filter up into air conditioner.

(2) Install gasket (fig. 5-1) and filter cover and secure with twelve screws.

## Section I. REPAIR OF REFRIGERANT PIPING

### Tubing and Fittings

The refrigerant piping consists of copper and the necessary fittings. The following cautions should be used when replacing a length of tubing.

Discharge refrigerant system (para. 5-6b).

Cut tubing with a sharp wheel cutter or hacksaw of 32 teeth per inch. Avoid burrs or malformation of the tubing.

### CAUTION

Care must be taken to prevent filings or cuttings from entering the tube. All particles should be cleaned out prior to completing connections. Failure to do this may result in damage to the system.

Cut tubing square and remove any burrs from inside or outside with a sharp fine file. Holding so filings will drop away from openings.

If tubing is not perfectly round, size the end on a sizing tube.

e. Clean the ends of tubing with crocus cloth or wire brush. Do not under any circumstances use sandpaper, emery cloth, or steel wool for this purpose.

f. Slip tubing into fitting until it seats properly.

### WARNING

Brazing operations should be done using eye protective equipment and brazing rods NOT containing cadmium. Medical personnel should NOT be asked if doubt exists as to brazing rod composition or to ventilation requirements.

g. Braze copper to copper joints with silver solder type 3, 4 or 6A Specification QQ-W-561 per MIL-B-7883. Solder melting point is 1160°F (634.8°C). All brazed or soldered joints shall be made with an atmosphere of inert gas to prevent internal oxidation.

h. Replace tubing and recharge refrigerant system (para. 5-6d).

## Section II. REPAIR OF COILS

### General

The evaporator coil extracts heat from the air conditioned space by the vaporization of liquid refrigerant passing through its tubed path. The condenser coil rejects the heat picked up by the evaporator coil and the heat of compression to the outdoor air. The lower portion of the condenser coil serves to condense the liquid refrigerant below its saturated condensing temperature.

### Evaporator Coil Removal

Refer to paragraph 5-21a and remove evaporator coil from air conditioner.

coil from air conditioner.

### 6-5. Repair

Refer to paragraph 5-7 and test for leaks or holes. Repair minor leaks or holes by soldering. A silver solder with a 50% silver capacity and a melting point of approximately 1160°F (634.8°C) is recommended. Straighten bent fins prior to installation.

### 6-6. Evaporator Coil Installation

Refer to paragraph 5-21b and install evaporator coil in air conditioner.



1. Fire Protection  
TB 5-4200-200-10

Hand Portable Fire Extinguishers Approved for  
Army Users

2. Lubrication  
C9100IL

Fuels, Lubricants, Oils and Waxes

3. Painting  
TM 43-0139

Painting Instructions for Field Use

4. Maintenance  
TM 5-4120-351-24P

Organizational, Direct Support and General Support Repair Parts and Special Tools List for Air Conditioner, Horizontal: 115 Volts, 60 Hertz, 1-Phase, 9,000 BTU/HR, NSN 4120-00-592-4645

TM 38-750

The Army Maintenance Management System  
(TAMMS)

TM 740-90-1

Administrative Storage of Equipment

TM 11-483

Radio Interference Suppression

TM 38-230-2

Preservation, Packaging and Packing of Military Supplies and Equipment

Fed Spec P-D-680

Dry Cleaning Solvent

TM 5-764

Electric Motor and Generator Repair

A-5. Demolition  
TM 750-244-3

Procedures for Destruction of Equipment to Prevent Enemy Use





## Section I. INTRODUCTION

### B-1. General

*a.* This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

*b.* The Maintenance Allocation Chart (MAC) in Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

*c.* Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II. (Not applicable.)

*d.* Section IV contains supplemental instructions on explanatory notes for a particular maintenance function. (Not applicable.)

### B-2. Maintenance Functions

*a. Inspect.* To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

*b. Test.* To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

*c. Service.* Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

*d. Adjust.* To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

*e. Align.* To adjust specified variables elements of an item to bring about optimum or desired performance.

of two instruments, one which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

*g. Install.* The act of emplacing, seating, fitting into position an item, part, or module (component or assembly) in a manner to allow the functioning of an equipment or system.

*h. Replace.* The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

*i. Repair.* The application of maintenance actions (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, machining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

*j. Overhaul.* That maintenance effort (series of actions) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMM) appropriate technical publications. Overhaul represents the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

*k. Rebuild.* Consists of those services/operations necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild represents the highest degree of materiel maintenance performed on Army equipment. The rebuild operation involves the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying equipments/components.

### B-3. Column Entries Used in the MAC

*a. Column 1. Group Number.* Column

**tions.** Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph B-2.)

**d. Column 4, Maintenance Level.** Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform the maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work time figures will be shown for each level. The number of man-hours specified by the work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating con-

ditions. Column 5 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph B-2.)

C .....	Operator or crew
O .....	Organization Maintenance
F .....	Direct Support Maintenance
H .....	General Support Maintenance
D .....	Depot Maintenance

**e. Column 5, Tools and Equipment.** Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

**f. Column 6, Remarks.** This column shall contain a letter code in alphabetical order which shall be keyed to the remarks contained in Section IV.

# Section II. MAINTENANCE ALLOCATION CHART

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category*					(5) Tools and Equip
			C	O	F	H	D	
01	BODY CHASSIS							
		Panel, Grills			0.2			
		Repair			0.1			
		Inspect	0.1					
		Adjust	0.1					
		Inspect	0.1					
02	ELECTRIC MOTOR AND							
		Fans						
		Motor			0.5			
		Test			2.0			
		Repair			1.3			
		Replace						
03	STARTING AND PROTEC-							
		TIVE DEVICE						
		Switches			0.3			
		Test	0.1					
		Inspect			1.0			
		Replace			0.2			
04	WIRING							
		Miscellaneous			0.2			
		Wiring			0.4			
		Test			0.6			
		Repair			1.4			
		Replace						
06	GAS COMPRESSOR, PIPING							
		AND COMPONENTS						
		Compressor			0.3			
		Test				1.0		
		Service				6.0		
		Repair				6.0		
		Replace				6.0		
		Refrigerant Piping			1.0			
		Test				6.0		
		Repair				6.0		
		Replace						
		Evaporator Coil			1.0			
		Clean			1.0			
		Test				6.0		
		Repair				6.0		
		Replace						
		Condenser Coil			1.0			
		Clean			1.0			
		Test				6.0		
		Repair				6.0		
		Replace				6.0		
		Dehydrator				6.0		
		Sight Glass				6.0		
		Expansion valve				6.0		
		Test				0.2		